How to

Identify and Minimize Red Pine Shoot Moth Damage

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The red pine shoot moth, *Dioryctria resinosella*, feeds on newly expanding shoots and cones of red pine, *Pinus resinosa*. Damage has been reported from Maine, Michigan, Minnesota, Wisconsin, and southern Ontario. The red pine shoot moth is now considered a pest due to the large increase in the number and overall acreage of red pine plantations greater than 20 years of age in the Lake States region since the 1960's. It is likely that this insect can be found throughout the range of red pine. However, outbreak populations are usually restricted to red pine planted on sandy, dry sites.

Damage is most prevalent in trees greater than 20 years of age, in open-grown stands and along plantation edges. Attacks are more common in upper portions of tree crowns due to a distinct larval preference for large diameter shoots. Extended, heavy infestations result in forking and crookedness in main stems and branches, which can subsequently cause trees to become flat-topped. A growth impact study was conducted following a 9-year outbreak in central Wisconsin. Estimated height loss during this period was 38-65 percent and radial growth loss was 16-42 percent.

Heavily attacked trees often become flattened on top.

Larvae also attack and destroy developing pine cones. Natural regeneration may be reduced and cone crops in seed orchards or seed production areas may be damaged. In addition, since first-year conelets are initiated on the end of current

year shoots, cone production is also reduced by shoot attacks.

Populations of the red pine shoot moth have fluctuated widely. Generally, 2-3 years of damaging populations are followed by 7-10 intervening years of very low numbers. Sudden population crashes have been attributed to a buildup of parasites which attack and kill larvae and pupae. Seventeen different parasites have been recorded attacking this insect.

Symptoms

Begin looking for dying shoot tips in mid-June. Infested shoots have a characteristic pitch-mass formed of frass and resin at the point of initial attack. Only current year shoots will be infested.

Inner twig of an infested shoot exposed to show a mining larva.

Inner twig of an infested shoot exposed to show a pupal case.

Opening infested shoots will reveal a hollowed out axis packed with granular frass. Mid-summer examination of an infested shoot may reveal a single larva or pupa. Larvae may vary greatly in color, ranging from blackish to rosy purple on top; and from white to green below. The head and prothoracic shield are brown to black. Pupal cases are approximately 11-15 mm in length (1/2 inch), and light brown to black in color.

Adult wingspread is approximately 25 mm (1 inch). The forewings are mottled gray and brown with 2 to 3 light gray wavy lines visible. The hindwings are a smoky white with a black and white border.

Infested red pine shoot with characteristic pitch-mass formed the initial point of attack.

Adult red pine shoot moth.

Life History

Moths fly over an extended period, beginning in mid-July and continuing into mid-September. During this period, eggs are laid singly beneath bark flaps on branches or along the main trunk of the tree within the living crown. Eggs hatch within 7 to 10 days. Newly-hatched larvae construct a silken shelter called a hibernaculum in which they overwinter. The following spring, larvae become active, molt and leave their hibernaculum. They migrate to and bore into newly expanding shoots or cones. Normally, only a single larva attacks a shoot or cone, with each larva attacking one to three shoots during the summer. Though the majority of larvae finish feeding by mid-July, some can be found feeding into mid-August.

Prevention and Control

Forest managers should only be concerned in areas considered to be at high risk for this pest. These high risk zones include areas of large glacial sand deposits, such as those found in central Wisconsin, along the lower Wisconsin River valley and in east-central lower Michigan. In these dry, very sandy areas, consideration should be given to planting a species other than red pine. If red pine is planted, problems should be anticipated, especially if the management goal is producing a high quality product such as utility poles. Silvicultural measures which reduce edge effect and increase species diversity, especially along plantation edges may reduce populations of this insect. Following infestations, selectively remove damaged stems when thinning.

No direct controls are available for forest plantations. Clipping and destroying infested shoots will reduce moth populations and It may prevent some late-season shoot attacks if done as soon as attacks are noticed. However, the insects' habit of attacking large trees and shoots high in the crown makes clipping impractical except for ornamental trees or Isolated populations. In seed orchards or seed production areas, application(s) of an EPA registered Insecticide should reduce attacks from this insect.

References

Hainze, J. H. and D. M. Benjamin. 1983. Bionomics and pattern of attack of the red pine shoot moth, *Dioryctria resinosella* (Lepidoptera: Pyralidae), in Wisconsin. Canadian Entomologist 115:1169-1175.

Hainze, J. H. and D. M. Benjamin. 1984. Impact of the red pine shoot moth, *Dioryctria resinosella* (Lepidoptera: Pyralidae), on height and radial growth in Wisconsin red pine plantations. Journal of Economic Entomology 77:3642.

Goulding, H. A., D. J. Hall, K. F. Raffa and A. J. Martin. 1988. Wisconsin Woodlands: Identifying and managing pine pests in Wisconsin. Univ. Wisconsin-Extension, G3428, 47 pp.

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